

Name: \_\_\_\_\_

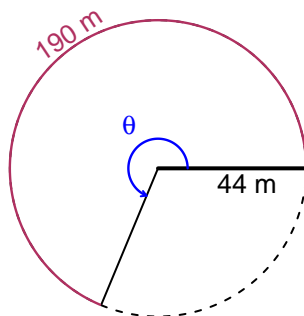
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## Trig Final (SLTN v690)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 190 meters. The radius is 44 meters. What is the angle measure in radians?

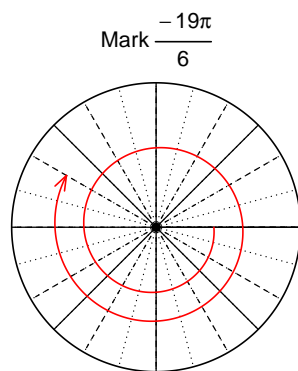


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$$\theta = 4.318 \text{ radians.}$$

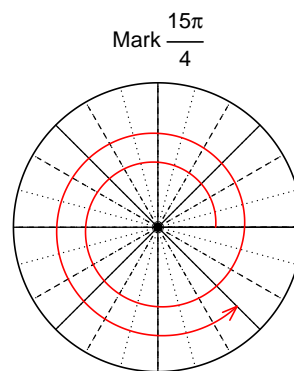
### Question 2

Consider angles  $-\frac{19\pi}{6}$  and  $\frac{15\pi}{4}$ . For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for  $\cos\left(-\frac{19\pi}{6}\right)$  and  $\sin\left(\frac{15\pi}{4}\right)$  by using a unit circle (provided separately).



Find  $\cos(-19\pi/6)$

$$\cos(-19\pi/6) = \frac{-\sqrt{3}}{2}$$



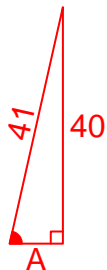
Find  $\sin(15\pi/4)$

$$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$$

### Question 3

If  $\sin(\theta) = \frac{-40}{41}$ , and  $\theta$  is in quadrant IV, determine an exact value for  $\cos(\theta)$ .

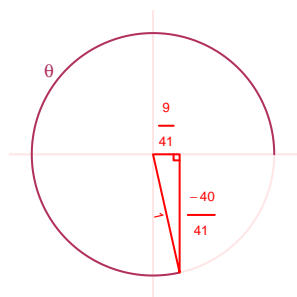
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 40^2 &= 41^2 \\A &= \sqrt{41^2 - 40^2} \\A &= 9\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{9}{41}$$

### Question 4

A mass-spring system oscillates vertically with a frequency of 4.33 Hz, an amplitude of 2.48 meters, and a midline at  $y = 6.6$  meters. At  $t = 0$ , the mass is at the maximum height. Write an equation to model the height ( $y$  in meters) as a function of time ( $t$  in seconds).

Any of these equations would get full credit.

$$y = 2.48 \cos(2\pi 4.33t) + 6.6$$

or

$$y = 2.48 \cos(8.66\pi t) + 6.6$$

or

$$y = 2.48 \cos(27.21t) + 6.6$$